APPLICABILITY OF MATHEMATICAL – CONCEPT - BASED TEACHING FOR PRIMARY SCHOOL LEVEL IN PAPUA NEW GUINEA. - *Seeking for Useful Materials and Methods in the Transition from the Outcome-Based Education (OBE) to the Standard-Based Education (SBE).*

Education for Specialized Subject Matter and Field
International Education Course
Anda Apex Apule

Supervisor: Hiroki Ishizaka

Today's society requires individuals to acquire mathematics knowledge as a necessary means for productive citizenship and gainful employment (NCTM, 2010). However, mathematics literacy in Papua New Guinea (PNG) has always been problematic with regard to several research findings. Recent study (Apule, et al; 2016) using 4th grade TIMSS sample mathematics test items discovered critical issues of PNG mathematics education and recommended change in the current practices and place more focus on the framework of improving the teaching and learning at the primary school level.

Perhaps, over the last two decades, PNG has undergone several curriculum reforms in attempt to improve the quality of education for its citizen, however, implementation of those curriculum reforms have always been a problem due to teachers lack of understanding underlying curriculum and its practices as well as inappropriate teaching methods of core subjects like mathematics. There again, due to public outcry on students' performance and drop in literacy and numeracy rates called for a new educational approach though the Czuba report (2013). In 2015, PNG abolished the Outcome Based Education (OBE) or curriculum (OBC) to adopt a new educational approach called Standard Based Education (SBE) or curriculum (SBC) which is intended to improve the performance of students and raise the standards of important subject like mathematics which is essential for students to face the challenges of the 21st century.

This research was carried out in an attempt to seek for the applicability of useful materials and methods for concept-based mathematics teaching and learning in PNG at the primary school level in the transition from the OBE to SBE using post-treatment instruction. In the process, the related purpose was to examine the existing practices for teaching mathematics in PNG classroom in order to provide suggestions for concept-based teaching of mathematics. For these purposes, the study focused on fraction concept because it forms an integral part of

the middle level mathematics curriculum (Lamon, 1999, Litwiller & Bright, 2002), underpinning the development of proportional reasoning, and important for later topics in mathematics, including algebra and probability.

A test consisted of six fraction comparison items was administered as pretest and posttest respectively to a total of 76 seventh grade students from two classes, assigned as Experimental Class (EC) and Control Class (CC). The experimental class received interventions on fraction concept using (i) CRA sequence of instruction (Butler et al., 2003; Maccini & Hughes, 1997) and (ii) an instructional intervention based on a theory of structured 'problem-solving' approach as distinguished in Japanese mathematic lesson 'pattern' (Shimizu, 2000; Sigler & Hiebert, 1999; Yoshida & Sawano, 2002). The CRA sequence of instruction guided the development of learning materials over three interventional fraction comparison lessons, while characteristics of Japanese mathematics lesson "pattern" guided the delivery of each interventional lesson. The experimental group performance was compared to a control group, which received instruction on the same fractions topics, but with no connections made between learning materials and teaching methods applied during the lessons. Both quantitative and qualitative revealed that those who received the interventional instruction improved more by showing greater understanding through their justifications and conceptual reasoning and outperformed their peers who had received regular instruction. Teaching implications and recommendations are discussed.

Hence, in the light of the recent educational reform to the SBC in PNG, this paper proposes a change in the traditional culture of mathematics instruction to concept-based teaching through applicable materials and methods, which is fundamental to the overall success of the reform in PNG's National Education System (NES).